Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
Applicant: Akihiro MORI
Titl : Storage System, Storage System Control Method, and...
Atty Dock t No. 16869K-090500US
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FIG. 1

Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
Applicant: Akihiro MORI
Title: Storage System, Storage System Control Method, and...
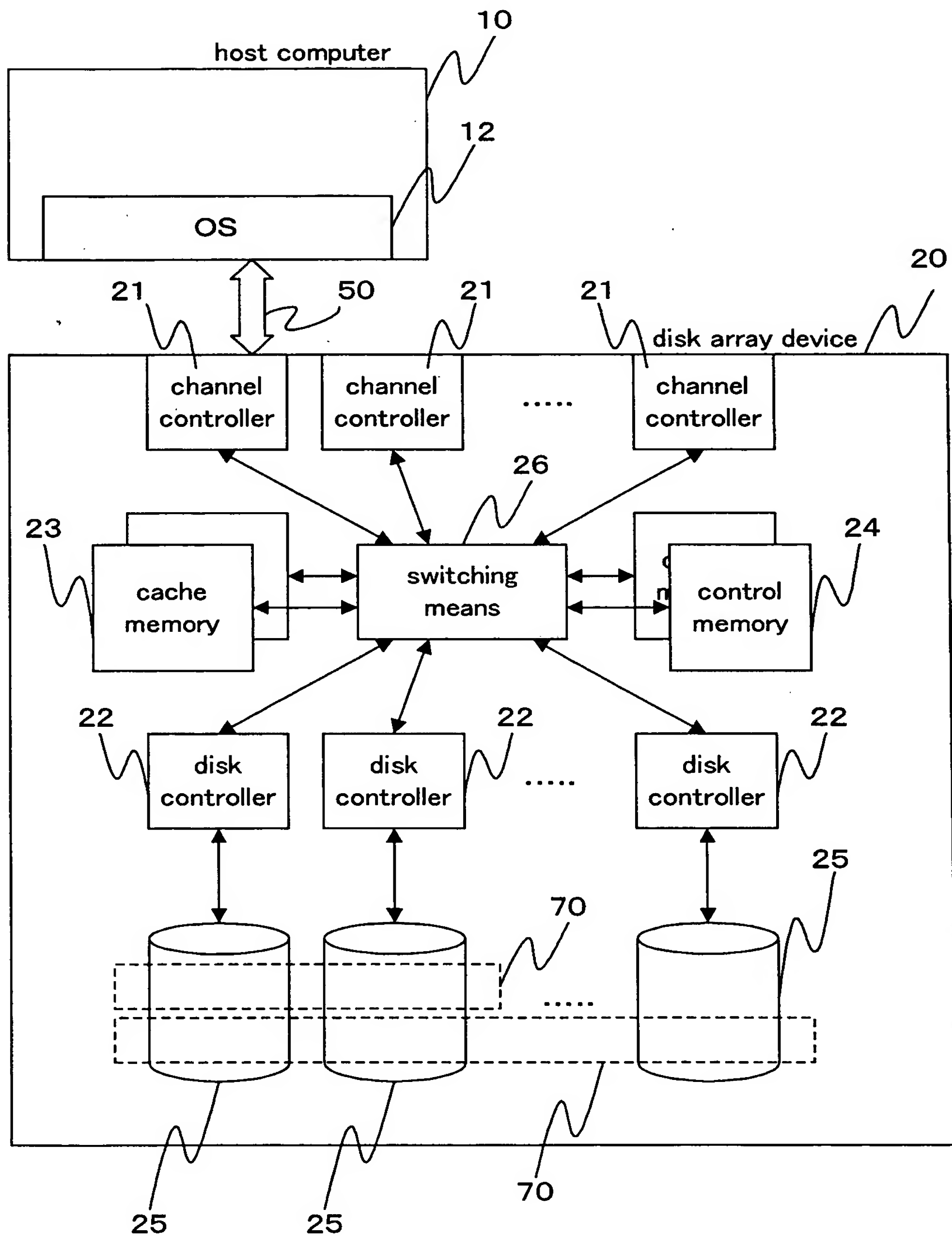Atty Docket No. 16869K-090500US
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```
          ( start )
              |                    S211
   +--------------------+
   | obtain volume name |
   | and data set name  |
   | that are to be     |
   | newly assigned     |
   +--------------------+
              |                    S212
   +--------------------+
   | obtain volume name |
   | and data set name  |
   | applied to primary |
   | logical volume     |
   +--------------------+
              |                    S213
   +--------------------+
   | obtain VTOC dump   |
   | information        |
   +--------------------+
              |                    S214
   +--------------------+
   | generate first     |
   | control program    |
   +--------------------+
              |                    S215
   +--------------------+
   | obtain VVDS dump   |
   | information        |
   +--------------------+
              |                    S216
   +--------------------+
   | generate second    |
   | control program    |
   +--------------------+
              |                    S217
   +--------------------+
   | obtain catalog name|
   +--------------------+
              |                    S218
         /          \         YES
        < new catalog >------------------+         S219
         \  name?   /                    |
          \        /              +------------------+
             NO                   | generate third   |
              |                   | and fourth       |
              |                   | control programs |
              |                   +------------------+
              |<--------------------------+
              |
   +--------------------+
   | generate fifth and |
   | sixth control      |
   | programs           |
   +--------------------+            S220
              |
   +--------------------+
   | store first through|
   | sixth control      |
   | programs           |
   +--------------------+            S221
              |
          ( end )
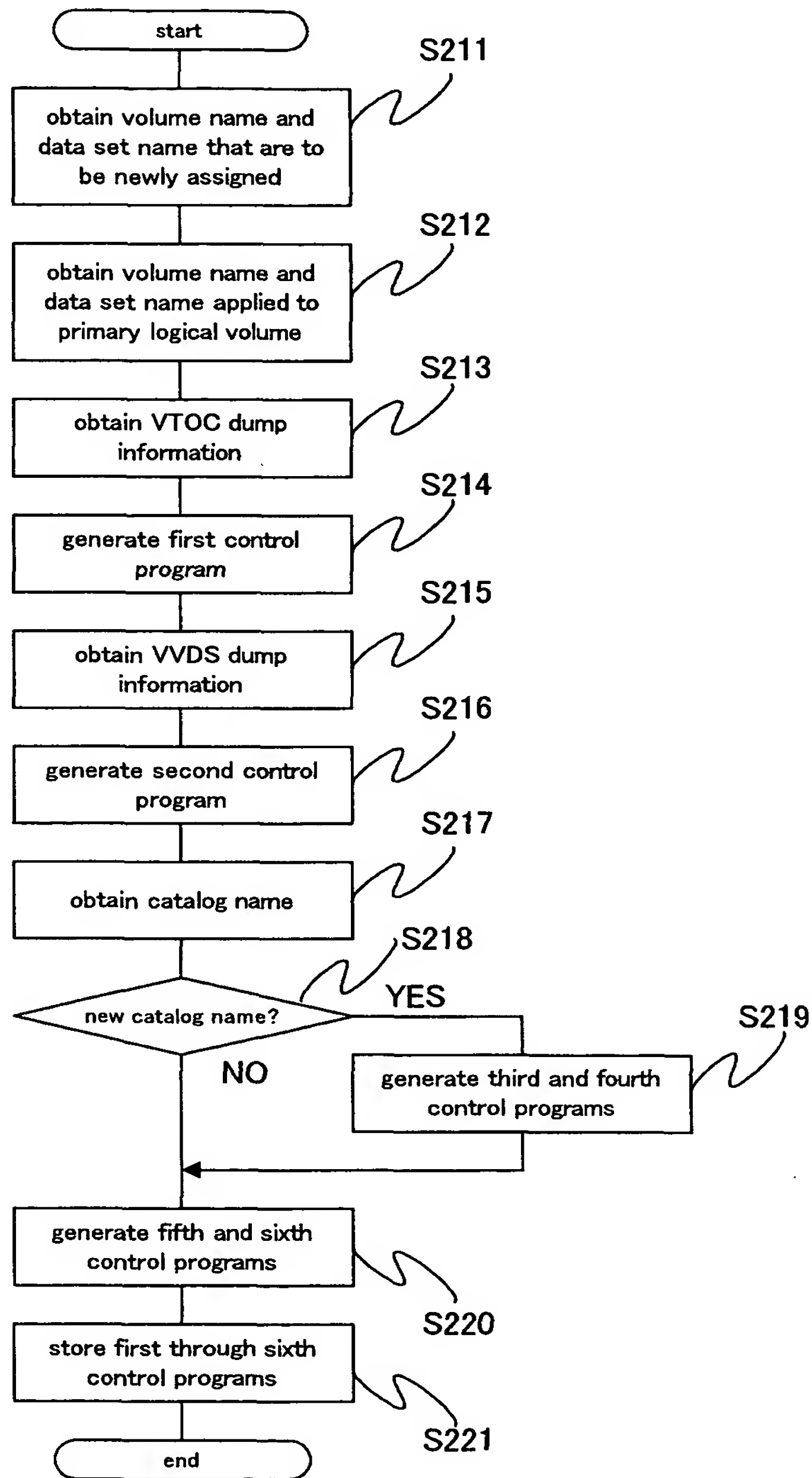```

# FIG. 2

Robert C. Colwell, Reg. No. 27,431       (650) 326-2400

Applicant: Akihiro MORI
Titl : Storage System, Storage System Control Method, and...
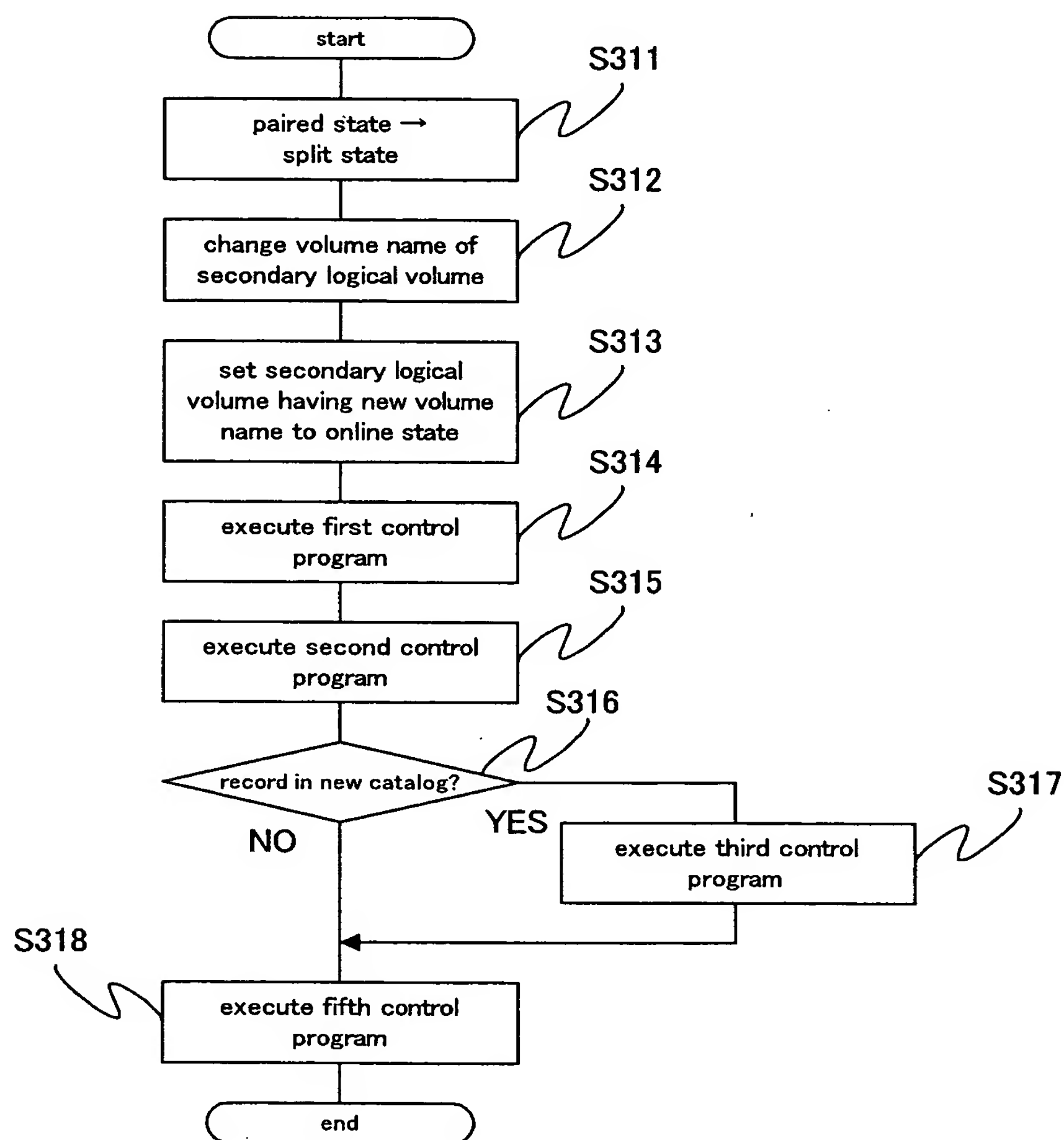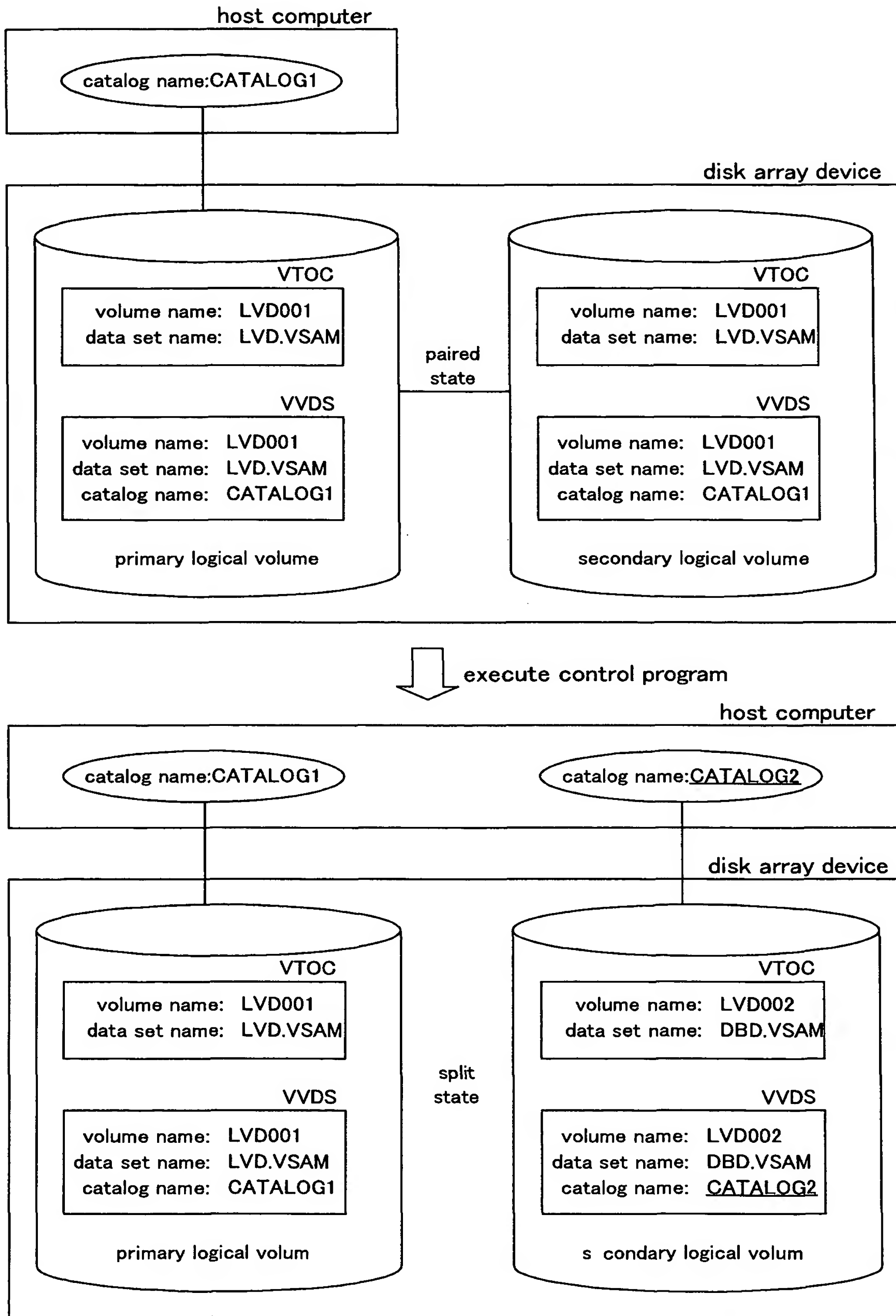Atty D ck t N . 16869K-090500US
She t 3 f 10

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```
                    ┌──────────────┐
                    │   start   │
                    └──────────────┘
                           │
              ┌────────────────────────┐   S311
              │   paired state →   │
              │   split state   │
              └────────────────────────┘   S312
                           │
              ┌────────────────────────┐
              │ change volume name of │
              │ secondary logical volume│
              └────────────────────────┘   S313
                           │
              ┌────────────────────────┐
              │ set secondary logical │
              │ volume having new volume│
              │ name to online state │
              └────────────────────────┘   S314
                           │
              ┌────────────────────────┐
              │ execute first control │
              │   program   │
              └────────────────────────┘   S315
                           │
              ┌────────────────────────┐
              │ execute second control │
              │   program   │
              └────────────────────────┘
                           │   S316
                        ◇─────────◇
                   ◇ record in new catalog? ◇ ─── YES ──┐
                        ◇─────────◇   │
                           │   │   S317
                          NO   ┌────────────────────┐
                           │   │ execute third control│
                           │   │   program   │
                           │   └────────────────────┘
                           │◄────────────────────────────┘
    S318   │
              ┌────────────────────────┐
              │ execute fifth control │
              │   program   │
              └────────────────────────┘
                           │
                    ┌──────────────┐
                    │   end   │
                    └──────────────┘
```
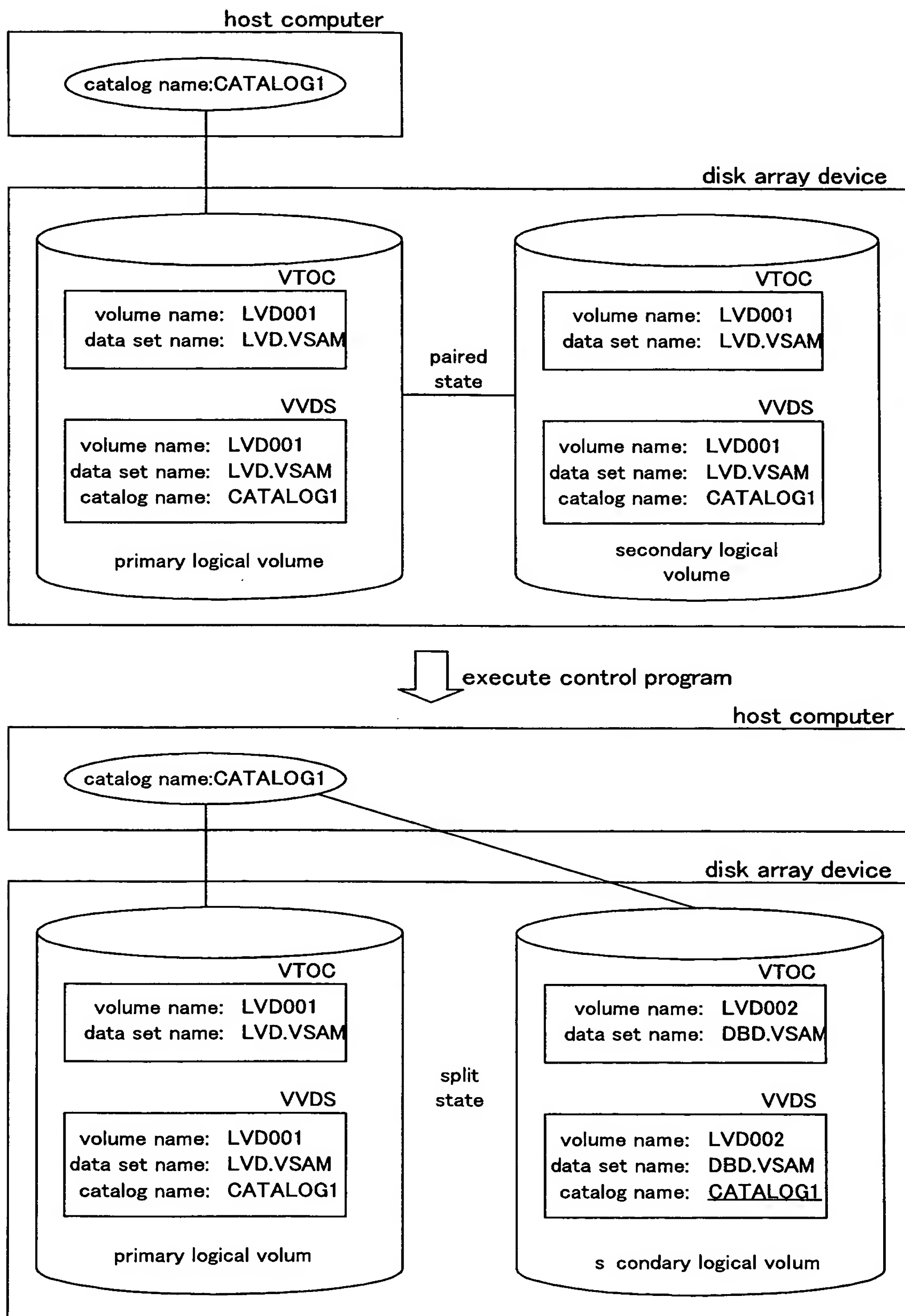
# FIG. 3

*Robert C. Colwell, Reg. No. 27,431*     *(650) 326-2400*

**Applicant:** Akihiro MORI
Titl : Storage System, Storage System Control Method, and...
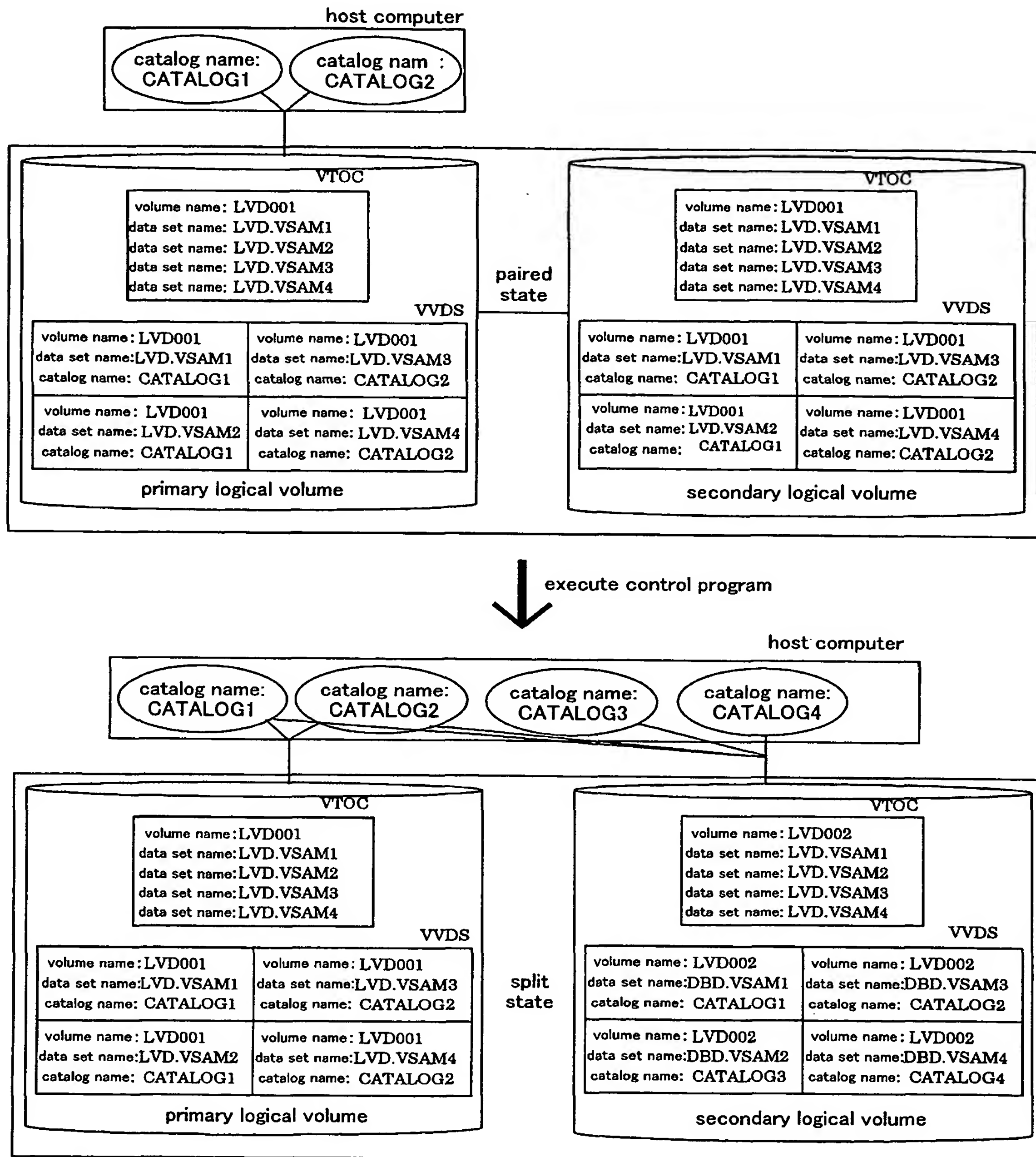**Atty D cket No.** 16869K-090500US
Sh  t  4  f  10

host computer

( catalog name:CATALOG1 )

disk array device

VTOC

| volume name: | LVD001 |
| data set name: | LVD.VSAM |

paired
state

VTOC

| volume name: | LVD001 |
| data set name: | LVD.VSAM |

VVDS

| volume name: | LVD001 |
| data set name: | LVD.VSAM |
| catalog name: | CATALOG1 |

VVDS

| volume name: | LVD001 |
| data set name: | LVD.VSAM |
| catalog name: | CATALOG1 |

primary logical volume

secondary logical volume

⇩ execute control program

host computer

( catalog name:CATALOG1 )          ( catalog name:CATALOG2 )

disk array device

VTOC

| volume name: | LVD001 |
| data set name: | LVD.VSAM |

split
state

VTOC

| volume name: | LVD002 |
| data set name: | DBD.VSAM |

VVDS

| volume name: | LVD001 |
| data set name: | LVD.VSAM |
| catalog name: | CATALOG1 |

VVDS

| volume name: | LVD002 |
| data set name: | DBD.VSAM |
| catalog name: | CATALOG2 |

primary logical volum

s  condary logical volum

# FIG. 4

Robert C. Colwell, Reg. No. 27,431    (650) 326-2400

**Applicant:** Akihiro MORI
**Titl** : Storage System, Storage System Control Method, and...
**Atty Dock t No.** 16869K-090500US
**Sh  t  5 of  10**

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## host computer

( catalog name:CATALOG1 )

### disk array device

**VTOC**

| volume name: | LVD001 |
|---|---|
| data set name: | LVD.VSAM |

**VVDS**

| volume name: | LVD001 |
|---|---|
| data set name: | LVD.VSAM |
| catalog name: | CATALOG1 |

primary logical volume

paired
state

**VTOC**

| volume name: | LVD001 |
|---|---|
| data set name: | LVD.VSAM |

**VVDS**

| volume name: | LVD001 |
|---|---|
| data set name: | LVD.VSAM |
| catalog name: | CATALOG1 |

secondary logical
volume

⬇ execute control program

## host computer

( catalog name:CATALOG1 )

### disk array device

**VTOC**

| volume name: | LVD001 |
|---|---|
| data set name: | LVD.VSAM |

**VVDS**

| volume name: | LVD001 |
|---|---|
| data set name: | LVD.VSAM |
| catalog name: | CATALOG1 |

primary logical volum

split
state

**VTOC**

| volume name: | LVD002 |
|---|---|
| data set name: | DBD.VSAM |

**VVDS**

| volume name: | LVD002 |
|---|---|
| data set name: | DBD.VSAM |
| catalog name: | CATALOG1 |

s condary logical volum

# FIG. 5

Robert C. Colwell, Reg. No. 27,431    (650) 326-2400

**Applicant:** Akihiro MORI
**Title:** Storage System, Storage System Control Method, and...
**Atty Dock t No.** 16869K-090500US
**Sh t 6 of 10**

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host computer

catalog name: CATALOG1    catalog nam : CATALOG2

VTOC

volume name: LVD001
data set name: LVD.VSAM1
data set name: LVD.VSAM2
data set name: LVD.VSAM3
data set name: LVD.VSAM4

VVDS

volume name: LVD001
data set name:LVD.VSAM1
catalog name: CATALOG1

volume name: LVD001
data set name:LVD.VSAM3
catalog name: CATALOG2

volume name: LVD001
data set name: LVD.VSAM2
catalog name: CATALOG1

volume name: LVD001
data set name: LVD.VSAM4
catalog name: CATALOG2

primary logical volume

paired state

VTOC

volume name:LVD001
data set name: LVD.VSAM1
data set name: LVD.VSAM2
data set name: LVD.VSAM3
data set name: LVD.VSAM4

VVDS

volume name: LVD001
data set name:LVD.VSAM1
catalog name: CATALOG1

volume name: LVD001
data set name:LVD.VSAM3
catalog name: CATALOG2

volume name: LVD001
data set name: LVD.VSAM2
catalog name:  CATALOG1

volume name: LVD001
data set name:LVD.VSAM4
catalog name: CATALOG2

secondary logical volume

execute control program

host computer

catalog name: CATALOG1    catalog name: CATALOG2    catalog name: CATALOG3    catalog name: CATALOG4

VTOC

volume name:LVD001
data set name:LVD.VSAM1
data set name:LVD.VSAM2
data set name:LVD.VSAM3
data set name:LVD.VSAM4

VVDS

volume name:LVD001
data set name:LVD.VSAM1
catalog name: CATALOG1

volume name: LVD001
data set name:LVD.VSAM3
catalog name: CATALOG2

volume name: LVD001
data set name:LVD.VSAM2
catalog name: CATALOG1

volume name: LVD001
data set name:LVD.VSAM4
catalog name: CATALOG2

primary logical volume

split state

VTOC

volume name: LVD002
data set name: LVD.VSAM1
data set name: LVD.VSAM2
data set name: LVD.VSAM3
data set name: LVD.VSAM4

VVDS

volume name: LVD002
data set name:DBD.VSAM1
catalog name: CATALOG1

volume name: LVD002
data set name:DBD.VSAM3
catalog name: CATALOG2

volume name: LVD002
data set name:DBD.VSAM2
catalog name: CATALOG3

volume name: LVD002
data set name:DBD.VSAM4
catalog name: CATALOG4

secondary logical volume

# FIG. 6

*Robert C. Colwell, Reg. No. 27,431*     *(650) 326-2400*

**Applicant:** Akihiro MORI

**Title:** Storage System, Storage System Control Method, and...
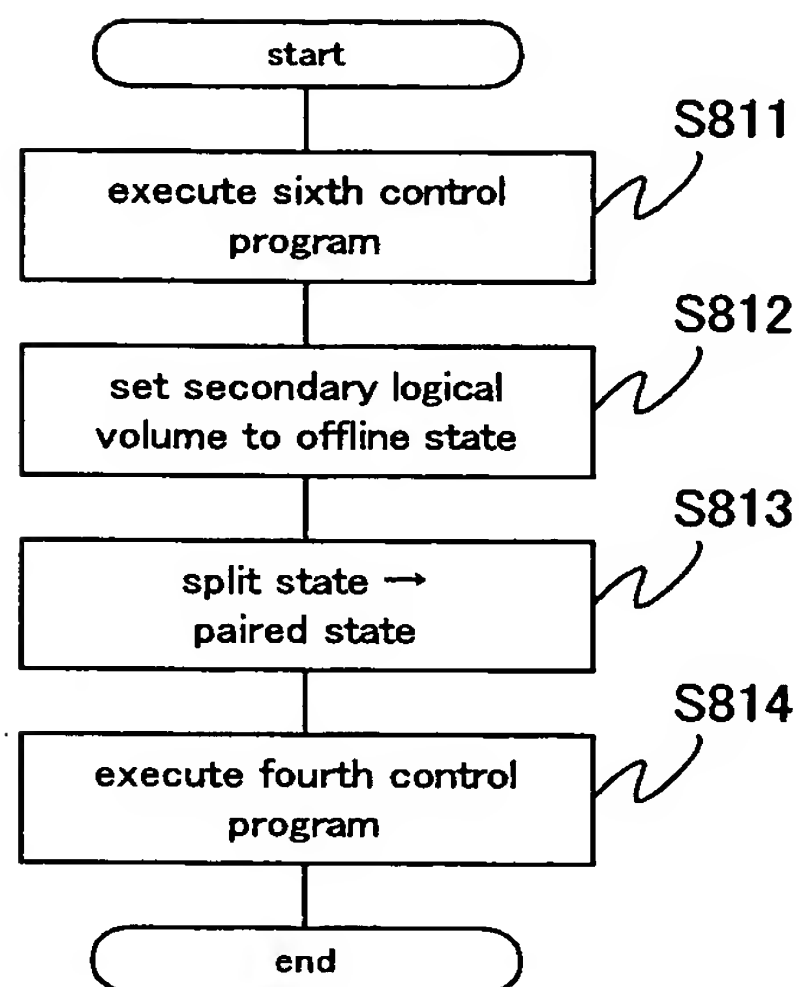
**Atty D ck t No.** 16869K-090500US

**Sheet 7 of 10**

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.

.

.

```
//SYSIN DD *
  CATALOG(CATALOG1,CATALOG2)
                                ···designate catalog name(s) used for recording
  CHGVOL(LVD001,LVD002)
                                ···designate volume name(s) to be changed
  CHGDSN(LVD.VSAM,DBD.VSAM)
                                ···designate data set name(s) to be changed
//
```

.

.

.

FIG. 7

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.

.

```
//SYSIN DD *
  CATALOG(CATALOG1)
                                ···designate catalog name(s) used for recording
  CHGVOL(LVD001,LVD002)
                                ···designate volume name(s) to be changed
  CHGDSN(LVD.VSAM,DBD.VSAM1)
                                ···designate data set name(s) to be changed
//
```

.

.

.

FIG. 8

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.
.
.

```
//SYSIN DD *
   CATALOG (CATALOG1)
   CATALOG (CATALOG2)
   CATALOG (CATALOG1, CATALOG3)
   CATALOG (CATALOG2, CATALOG4)
   CHGVOL (LVD001, LVD002)
   CHGDSN (LVD. VSAM, DBD. VSAM)
   RECAT (CATALOG1, CATALOG1, LVD. VSAM1) ...designate
        catalog information for before and after change and data set information for before change
   RECAT (CATALOG1, CATALOG3, LVD. VSAM2)
   RECAT (CATALOG2, CATALOG2, LVD. VSAM3)
   RECAT (CATALOG2, CATALOG4, LVD. VSAM4)
//
```

.
.
.

FIG. 9

Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
Applicant: Akihiro MORI
Titl : Storage System, Storage System Control Method, and...
Atty Docket No. 16869K-090500US
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```
          ┌──────────────┐
          │    start     │
          └──────┬───────┘
                 │
       ┌─────────┴─────────┐        S811
       │  execute sixth control │  ╲╱
       │       program      │
       └─────────┬─────────┘
                 │
       ┌─────────┴─────────┐        S812
       │  set secondary logical │  ╲╱
       │  volume to offline state │
       └─────────┬─────────┘
                 │
       ┌─────────┴─────────┐        S813
       │   split state  →   │  ╲╱
       │    paired state    │
       └─────────┬─────────┘
                 │
       ┌─────────┴─────────┐        S814
       │  execute fourth control │  ╲╱
       │       program      │
       └─────────┬─────────┘
                 │
          ┌──────┴───────┐
          │     end      │
          └──────────────┘
```

FIG. 10

Robert C. Colwell, Reg. No. 27,431   (650) 326-2400
Applicant: Akihiro MORI
Titl : Storage System, Storage System Control Method, and...
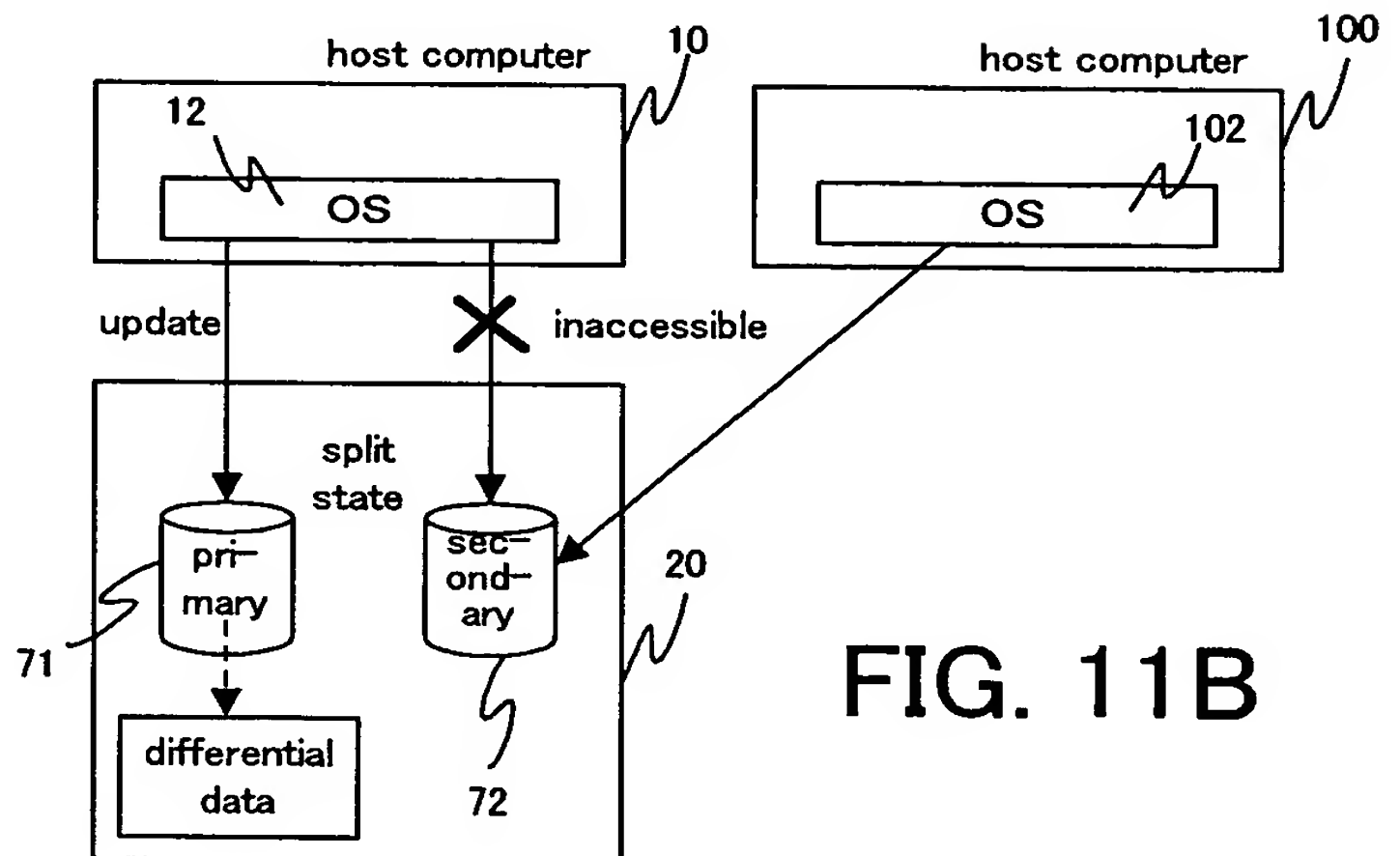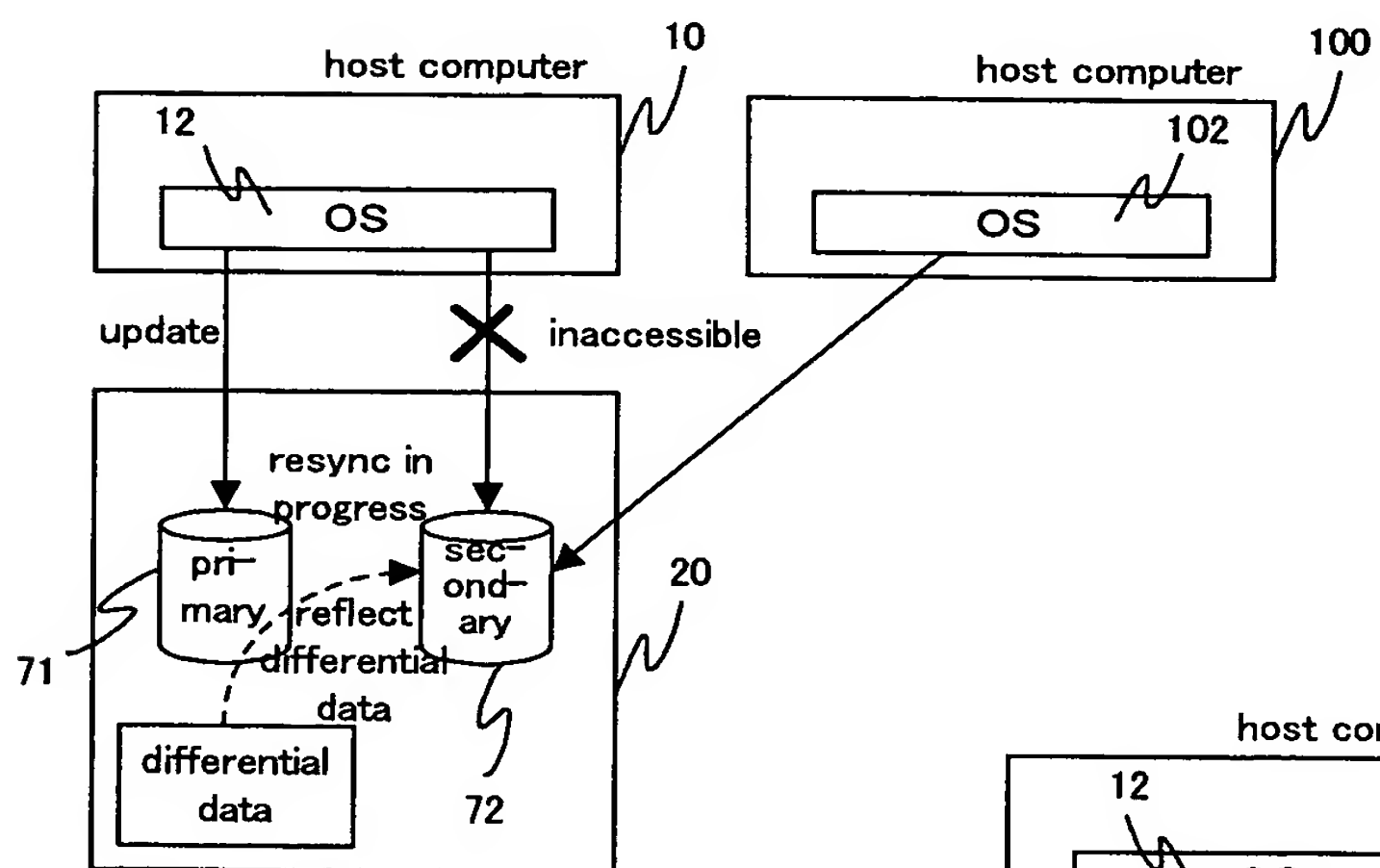Atty D ck t No. 16869K-090500US
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FIG. 11A

host computer — 10

12 — OS

host computer — 100

102 — OS

update

✗ inaccessible

✗ inaccessible

paired state

primary

reflect

secondary — 20

71   72

FIG. 11B

host computer — 10

12 — OS

host computer — 100

102 — OS

update

✗ inaccessible

split state

primary — 71

secondary — 20

differential data

72

FIG. 11C

host computer — 10

12 — OS

host computer — 100

102 — OS

update

✗ inaccessible

resync in progress

primary — 71

reflect differential data

secondary — 20

differential data

72

FIG. 11D

host computer — 10

12 — OS

host computer — 100

102 — OS

update

✗ inaccessible

✗ inaccessible

paired state

primary

secondary — 20

71   72